

Accelerated Line-by-Line Calculation of Spectral Absorption Coefficients

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Accurate modeling of radiative transfer through the atmosphere requires the calculation of spectral absorption coefficients on a line-by-line basis. The calculation of these coefficients is computationally expensive for two reasons: (1) a single line may contribute to absorption over a wide range of frequencies, and (2) a large number of lines may contribute to absorption at a given frequency. We present a new algorithm for rapid calculation of these absorption coefficients. The algorithm requires defining a sequence of successively finer frequency grids (at run time) and interpolating from coarser to finer grids. Numerical accuracy is controlled by the user. The algorithm has been implemented in SEASCRAPE (Sequential Evaluation Algorithm for Simultaneous and Concurrent Retrieval of Atmospheric Parameter Estimates), a code developed to automate and expedite the retrieval of atmospheric parameters (such as temperature, pressure, and composition) from large quantities of remote sounding spectral data. Preliminary tests show a dramatic reduction in the time required to calculate absorption coefficients with negligible loss of numerical accuracy.